



A Deep Learning Approach for Diabetic Retinopathy and Cataract Detection

Zahraa H. Ali^{1*}, Adala M. Chaid², Zaid Ameen Abduljabbard³, Vincent Omollo Nyangaresie⁴ and Ali Hasan Ali⁵

¹Department of Geology, College of Science, University of Basrah, Basra, Iraq.

²Department of Computer Information Systems, College of Computer Science & Information Technology, University of Basrah, Iraq

³Department of Computer Science, College of Education for Pure Sciences, University of Basrah, Iraq

⁴Department of Computer Science and Software Engineering, Jaramogi Oginga Odinga University of Science & Technology, Kenya

⁵Department of Mathematics, College of Education for Pure Sciences, University of Basrah, Basrah, Iraq.

*Corresponding author E-mail: zahraa.ali@uobasrah.edu.iq

<https://doi.org/10.29072/basis.20260109>

ARTICLE INFO

Received: 28 September 2025

Accepted: 12 January 2026

Published: 30 April 2026



This article is an open-access article distributed under the terms and conditions of the Creative Commons Attribution-NonCommercial 4.0 International (CC BY-NC 4.0 license) (<http://creativecommons.org/licenses/by-nc/4.0/>).

Keywords:

Deep Learning, Diabetic Retinopathy, Cataract Detection, Convolutional Neural Network (CNN), Ophthalmic Image Analysis.

ABSTRACT

This study describes a composite deep learning-based model of automated retinal image recognition that simultaneously targets to detect diabetic retinopathy (DR) and cataracts. The proposed approach combines both a convolutional neural network (CNN) to extract robust spatial features and a long short-term memory (LSTM) network to model feature dependencies in sequence, which allows detecting both ocular conditions with high accuracy using the same system. Retinopathy and cataracts are among the major causes of vision loss that are irreversible in cases of delay in the diagnosis of diabetes. Traditional diagnostic methods tend to neglect the combined use of feature and pattern recognition and therefore lead to a low degree of diagnostic reliability. In this paper, extensive image preprocessing practices and data augmentation practices are used to increase the model's robustness and generalization. The CNNLSTM model suggested is trained with the help of TensorFlow and Keras and tested on multiple publicly available retinal image datasets, including over 29,000 labeled images, Messidor-2, DDR, ODIR-5K, and APTOS-2019. In general, the current research presents a valid and effective deep learning system that can be used to detect diabetic retinopathy and cataracts early and consistently with a high degree of accuracy (94.5%), sensitivity (92.3%), specificity (96.8%), and, consequently, the F1-score (92.9) under identical experimental conditions and outperforms CNN-only and RNN-only baseline systems. Generally, the proposed research presents a stable and efficient deep learning framework that can be used to identify diabetic retinopathy and cataracts.